



## Medical Robots to the Rescue

### New Technologies to Help Our Health

What do you think of when you hear the word robot? Is it a human-like assistant with a friendly face, or a large and menacing foe? Generally, a robot is a machine that has been built to perform specific tasks.

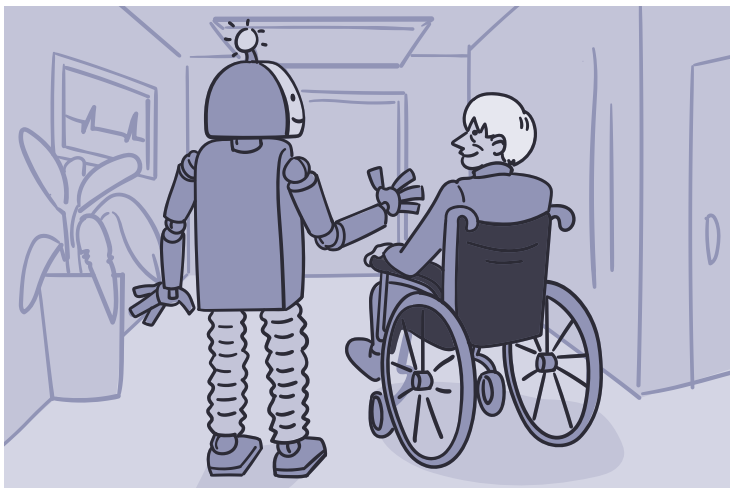
“When most people hear the term ‘robot,’ they think of things made of solid metal and electronics,” says Dr. Ryan Sochol, a mechanical engineer at the University of Maryland.

But medical robots can come in many shapes and sizes.

Sochol and his colleagues are creating tiny flexible robots to improve surgical techniques. Other scientists are developing wearable robots to enhance mobility. And others are creating and testing human-like social robots. These may be able to provide information and improve well-being.

Most of these robotic devices are still in the research and development phase. They’re not yet ready for general use. But some may become available within the next five to ten years.

Robots usually have three key features. They have a sensor that can detect things—like light, motion, heat, or sound. They have an “actuator” that converts energy into movement. And they have a control system or computer program that directs the robot’s activities. Many robots today also depend on artificial intelligence (AI) to assess large amounts of data.



“Robots are everywhere. Even many cars now have robots,” says Dr. Xiaopeng Zhao, a biomedical engineer at the University of Tennessee, Knoxville. These systems can help drivers with parking, staying within lanes, or cruise control. “And with the support of AI technology, robots will become more useful and more powerful.”

**Social Robots Help Out** • Zhao and others are studying how human-like, interactive robots could help people with dementia and their caregivers. As the U.S. population ages, there’s a growing need for caregivers. Family caregivers often provide countless hours of support. That can lead to a lot of stress.

Zhao and his team interviewed patients and caregivers at assisted living facilities, senior centers, and memory clinics. They asked about their needs and challenges. They then customized a four-foot tall, human-like robot. It has a touch screen on its chest. These

AI-powered robots can listen, talk, move, play videos, and dance. They can also encourage people to reminisce about earlier experiences.

“Patients with Alzheimer’s can have short-term memory loss,” Zhao says. “But they may be able to recall what happened 20 or 30 years ago.”

The robots can play old songs, discuss sports, or ask questions to trigger memories. “Reminiscing

may not restore memory, but it can improve emotional well-being and quality of life,” Zhao says. Robots can patiently listen to the same stories over and over.

Zhao’s group is also developing robots that can assist caregivers by providing evidence-based information about dementia. The robots can give tips to help caregivers reduce their own stress and stay healthy.

**Robots for Surgery** • Other researchers have been developing tiny robotic tools to help surgeons and physicians. Robotic surgery can lead to less pain and blood loss, smaller scars, and quicker recovery.

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It can have fewer complications compared to traditional surgery.

Robotic surgeries usually involve making little openings through the skin and then inserting small 3D cameras and surgical tools. Sochol's team is developing miniature tools and robotic techniques to assist with complex surgeries. They're creating soft robotic devices, made of flexible or compliant materials. These flexible gadgets are helping to improve a type of brain surgery for weakened and bulging blood vessels, called aneurysms.

Minimally invasive aneurysm surgery typically involves threading a thin plastic tube, or microcatheter, through the body to reach the brain. The weakened blood vessel can then be repaired or sealed. But the microcatheter has to make many twists and turns along the way, and it can be hard to maneuver. If the catheter can't reach the aneurysm, the surgery must be canceled.

Sochol and his team used 3D printing to create microcatheters that surgeons can steer to reach these tricky parts of the brain. "We created a soft robotic microcatheter that can bend on demand during the

procedure to help surgeons reach those hard-to-access areas," he says.

Other NIH-supported scientists are developing soft robotic techniques to improve heart surgery, bowel surgery, and lung biopsies. These soft robotic tools are still considered experimental.

**Wearable Robotics** • NIH also funds studies to develop artificial limbs, or prosthetic devices, to replace lost or damaged body parts. Some of these robotic devices connect to the brain and let people control movement of artificial hands, legs, and other limbs. (To learn more, see [go.nih.gov/NIHNiHJun25Bionic](https://go.nih.gov/NIHNiHJun25Bionic)).

Other researchers are developing battery-powered exoskeletons to help move existing limbs. "Exoskeletons are robots that you wear on your body. They can fit on top of your limbs, kind of like clothing. You can put them on and take them off, like boots or pants," says Dr. Gregory Sawicki, a biomedical engineer at the Georgia Institute of Technology. "They can work in synch with your muscles, so your muscles don't have to do all the work."

Sawicki and his colleagues have been studying how exoskeletons might help improve mobility and prevent falls as people age. Falls can lead to fractures, hospitalization, and disability in older adults. "A primary reason why people fall is that their body can't react fast enough," Sawicki says. Robots have the potential to respond more quickly to balance problems than the human body can. Researchers are working to develop more comfortable and lightweight exoskeletons that seem more like clothing.

"To live long happy lives, we've got to be mobile for as long as possible. Mobility helps us have social connections, which are incredibly

important as we age," Sawicki says. "These kinds of mobility assistive technologies can help us move farther on less energy and to interact with people."

Robots can make life easier or better in many ways. But they're not substitute for human interactions.

"It's clear that many tasks can be done by robots. They're especially helpful with repetitive or tedious tasks," Zhao adds. "But when we're talking about love, empathy, and bonding between humans, these qualities remain uniquely human." ■



## Wise Choices

### Medical Robots in Development

NIH supports several robot-related studies that aim to improve human health and well-being, including:

- "Gripper" tools that can help people reach and maneuver everyday items, like utensils or laundry.
- Devices to track whether patients are taking prescribed medications as directed.
- Head-mounted robotic technology that improves delicate sight-saving eye surgeries.
- Magnet-guided robots to provide safer and more comfortable alternatives to standard colonoscopy.
- Robot-assisted correction of ankle bone fractures and injuries.
- Unique flexible robot to improve radiation therapy for breast cancer.
- Robotic "smart" needle to improve accuracy and reduce invasiveness of radiation therapy for prostate cancer.

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**Web Links**

For more about medical robots, see "Find More Information" in the online article: [newsinhealth.nih.gov/2025/06/medical-robots-rescue](https://newsinhealth.nih.gov/2025/06/medical-robots-rescue)

# Keep AMD Vision Loss In Check

## Healthy Lifestyle Can Protect Eye Health

Changes to your eyesight are normal with age. You may be less able to see up close without reading glasses. It may take your eyes longer to adjust to changing light levels. These problems can usually be corrected with glasses, contact lenses, or improved lighting. But some changes can be a sign of disease.

A condition called age-related macular degeneration, or AMD, is the leading cause of vision loss in older adults in the U.S. It's caused by light-sensing tissue in the back of your eye, or retina, deteriorating. The deterioration happens in the center of the retina, called the macula. In advanced stages, AMD can make it hard to see things clearly when you look straight ahead. You may not be able to recognize faces, read, drive, or do certain household tasks independently.

You're more likely to have AMD at age 55 and older. Smoking, high

cholesterol, and high blood pressure increase your risk for AMD. So does having a family history of the disease.

There are two types of AMD. Dry AMD, also called atrophic AMD, is more common. This condition progresses through several stages. Early AMD has no symptoms. In intermediate AMD, you might notice mild blurriness or have trouble seeing in low light. Late AMD usually causes a blurry area or blank spots in or near the center of your vision. Colors may appear faded.

The other type is called neovascular, or wet, AMD. It can cause fast vision loss if not treated promptly. In wet AMD, abnormal blood vessels grow in the back of the eye. These can bleed and leak fluid that damages the macula. A telltale sign is when straight lines appear wavy or crooked. Dry AMD can also turn into wet AMD.

It can take years for AMD to progress. When you detect it early, you can take steps to delay its progress.

An eye doctor can detect AMD using a dilated eye exam. In the exam, they dilate (or widen) your pupils using special eye drops. This allows them to see inside your eyes. They may also take pictures of the inside of your eye using a technique called optical coherence tomography.

If you are diagnosed with AMD, there are several things you can do to slow its progression. "For those early and intermediate stages, it's all about a healthy lifestyle," says Dr. Tiarnán Keenan, an ophthalmologist at NIH. This includes eating a healthy diet, getting enough physical activity, and not smoking. A healthy lifestyle may also lower your chances of getting AMD in the first place. See the Wise Choices box for tips.



Recently, the U.S. Food and Drug Administration approved the first two drugs for treating late dry AMD. Both were developed based on NIH-funded research. The drugs can slow the progression of dry AMD, but not stop or reverse it.

The most common treatments for wet AMD involve a doctor injecting medicines called anti-VEGF drugs into your eye. These help stop bleeding and fluid leakage from the abnormal blood vessels.

NIH-funded researchers have been looking into other ways to delay the progression of AMD. Studies have shown that special dietary supplements called AREDS2 can slow the progression from intermediate to wet AMD.

NIH researchers are also exploring using stem cell transplants to preserve the macula. They can take cells from a patient's blood and turn them into stem cells.

"In the lab, scientists can grow more of the cells. Then, they can transplant those cells into the eye of individuals with AMD," Keenan explains. A clinical trial is currently studying this treatment and recruiting participants. Learn more about this trial at [go.nih.gov/CTEXdr3](https://go.nih.gov/CTEXdr3). ■



### Wise Choices

#### Lower Your Risk of AMD

- **Eat a healthy diet**, including fruits and vegetables (especially dark leafy greens like spinach or kale) and fish high in omega-3 fatty acids (like salmon or tuna).
- **Get regular physical activity.** Experts recommend getting at least 150 minutes of moderate activity a week.
- **Maintain healthy blood pressure and cholesterol levels.**
- **Don't smoke, or quit if you do.** Get free help to quit smoking at [smokefree.gov](https://smokefree.gov), 1-800-QUIT-NOW (1-800-784-8669), or by texting QUIT to 47848.
- **Get regular eye exams.** Your eye doctor can tell you how often you need an exam based on your age and other risk factors.



### Web Links

For more about age-related macular degeneration, or AMD, see "Find More Information" in the online article: [newsinhealth.nih.gov/2025/06/keep-amd-vision-loss-check](https://newsinhealth.nih.gov/2025/06/keep-amd-vision-loss-check)







## Health Capsules

For links to more information, please visit our website and see these stories online.

### Treatment May Help Youth Quit Vaping

Nearly 1 in 4 youth between ages 18 and 25 regularly vape nicotine using e-cigarettes. Vaping puts youth at risk for nicotine addiction. It can also expose them to harmful chemicals. A new study showed that a smoking cessation drug may help youth quit vaping.

A drug called varenicline is FDA-approved for smoking cessation in adults. It works by blocking some effects of nicotine in the brain. This makes nicotine less enjoyable and reduces cravings.

The new study included 261 participants, ages 16 to 25, who vaped nicotine almost daily. They

were divided into three groups. All the groups received a referral to a free text messaging-based program called “This is Quitting.” It encourages people to quit vaping. One group was only given this referral. The other two groups received weekly counseling with a person trained to help youth stop vaping. One of these groups also took the drug varenicline twice a day. The other took an inactive placebo pill.

After 12 weeks, 51% of those taking varenicline had stopped vaping. Only 14% of those taking the placebo had quit. Just 6% of those who received only a referral stopped.

By six months, 28% of those who took varenicline still weren’t vaping, compared to 7% of those who took the placebo. Only 4% of those in the text-only group were still vape free.

“Vaping is extremely popular among kids,” says Dr. A. Eden Evins at Massachusetts General Hospital. “We know that ... early nicotine exposure can make drugs like cocaine more addictive down the line.”

More research is needed to learn how best to use the drug to reduce vaping among teens and young adults. ■

### What Is Scleroderma?

Scleroderma is a rare disease that affects the body’s connective tissue. Connective tissues support the skin and internal organs. The disease can cause skin, blood vessels, or other tissues to become hard or thick. It can also lead to swelling or pain in your muscles and joints.

The exact cause of scleroderma is unknown. It’s thought to be an autoimmune disease, which means the body’s disease-fighting system attacks its own cells and tissues. In

scleroderma, the damage triggers connective tissue cells to make too much of a protein called collagen. Excess collagen in your skin and other tissues can cause the areas to harden and tighten.

There are two main types of scleroderma: localized and systemic. Localized scleroderma usually affects only the skin and the structures underneath it. Systemic scleroderma affects many systems in the body. This includes the skin, tissues under

it, blood vessels, and major organs like the heart, lungs, and kidneys.

It can be difficult for doctors to diagnose scleroderma because the symptoms can vary. Treatment depends on your symptoms and which tissues and organs are affected. People with scleroderma often see a rheumatologist for treatment. But different types of doctors may be involved, depending on which organs are affected. Learn more at [go.nih.gov/NIHNiHJun25Scleroderma](http://go.nih.gov/NIHNiHJun25Scleroderma). ■



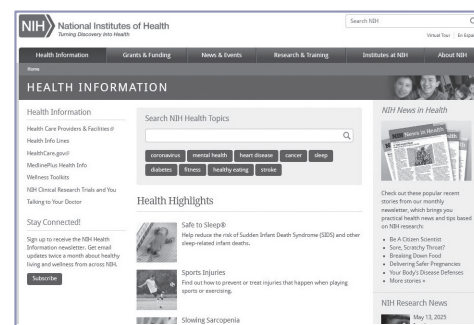
### Featured Website

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The NIH Health Information Portal provides access to reliable, science-based health resources. Find information from across NIH’s institutes and centers.

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